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Docket Number 50-346

NP-33-06-003-00
10 CFR 50.73

License Number NPF-3

November 5, 2006

United States Nuclear Regulatory Commission
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Washington, D.C. 20555-0001

Licensee Event Report 2006-003-00
Degraded Condenser Pressure Due to Failed Drain Line Results in Manual Reactor Trip
Davis-Besse Nuclear Power Station, Unit No. 1
Date of Occurrence – September 6, 2006

Ladies and Gentlemen:

Enclosed please find Licensee Event Report 2006-003-00, which is being submitted to provide written notification of an unplanned manual reactor trip. This manual trip was initiated in accordance with plant procedures due to high condenser pressure as a result of a failed turbine bearing waste water and oil drain pipe inside the condenser. This event is being reported pursuant to 10 CFR 50.73(a)(2)(iv)(A), an event that resulted in manual actuation of the Reactor Protection System. A 4-hour immediate notification of this event was made to the NRC on September 6, 2006 (Event No. 42828). Commitments associated with this LER are listed in the Attachment.

Very truly yours,

GMW

Attachment
Enclosure

cc: Regional Administrator, USNRC Region III
DB-1 Project Manager, USNRC
DB-1 NRC Senior Resident Inspector
Utility Radiological Safety Board

IE22

COMMITMENT LIST

The following list identifies those actions committed to by the Davis-Besse Nuclear Power Station in this document. Any other actions discussed in the submittal represent intended or planned actions by Davis-Besse. They are described only as information and are not regulatory commitments. Please notify the Manager – Regulatory Compliance (419-321-8585) at Davis-Besse of any questions regarding this document or associated regulatory commitments.

COMMITMENTS	DUE DATE
1. Cut and cap the piping for the other three turbine waste water and oil drains.	1. November 30, 2006
2. Revise the System Descriptions for the Main Turbine and Auxiliaries System and for the Condensate System to document the purpose of the turbine waste water and oil drains and to show they are routed through the condenser.	2. March 1, 2007
3. Permanently remove the four low pressure turbine waste water and oil drains via an Engineering Change.	3. During the Fifteenth Refueling Outage (currently scheduled for Spring 2008)

NRC FORM 366 (6-2004) U.S. NUCLEAR REGULATORY COMMISSION

APPROVED BY OMB NO. 3150-0104 EXPIRES 6/30/2007

Estimated burden per response to comply with this mandatory collection request: 50 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Send comments regarding burden estimate to the Records and FOIA/Privacy Service Branch (T-5 F52), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, or by internet e-mail to infocollects@nrc.gov, and to the Desk Officer, Office of Information and Regulatory Affairs, NEOB-10202 (3150-0104), Office of Management and Budget, Washington, DC 20503. If a means used to impose an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

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4. TITLE

Degraded Condenser Pressure Due to Failed Drain Line Results in Manual Reactor Trip

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO.	MONTH	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
										05000
09	06	2006	2006	- 003 -	00	11	05	2006	FACILITY NAME	DOCKET NUMBER 05000

9. OPERATING MODE

1

10. POWER LEVEL

045

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*

☐ 20.2201(b)	☐ 20.2203(a)(3)(i)	☐ 50.73(a)(2)(i)(C)	☐ 50.73(a)(2)(vii)
☐ 20.2201(d)	☐ 20.2203(a)(3)(ii)	☐ 50.73(a)(2)(ii)(a)	☐ 50.73(a)(2)(viii)(A)
☐ 20.2203(a)(1)	☐ 20.2203(a)(4)	☐ 50.73(a)(2)(ii)(B)	☐ 50.73(a)(2)(viii)(B)
☐ 20.2203(a)(2)(i)	☐ 50.36(c)(1)(i)(A)	☐ 50.73(a)(2)(iii)	☐ 50.73(a)(2)(ix)(A)
☐ 20.2203(a)(2)(ii)	☐ 50.36(c)(1)(ii)(A)	☒ 50.73(a)(2)(iv)(A)	☐ 50.73(a)(2)(x)
☐ 20.2203(a)(2)(iii)	☐ 50.36(c)(2)	☐ 50.73(a)(2)(v)(A)	☐ 73.71(a)(4)
☐ 20.2203(a)(2)(iv)	☐ 50.46(a)(3)(ii)	☐ 50.73(a)(2)(v)(B)	☐ 73.71(a)(5)
☐ 20.2203(a)(2)(v)	☐ 50.73(a)(2)(i)(A)	☐ 50.73(a)(2)(v)(C)	☐ OTHER Specify in Abstract below
☐ 20.2203(a)(2)(vi)	☐ 50.73(a)(2)(i)(B)	☐ 50.73(a)(2)(v)(D)	

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER *(Include Area Code)*
Gerald M. Wolf, Staff Engineer, Regulatory Compliance	(419) 321-8001

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX

14. SUPPLEMENTAL REPORT EXPECTED

☐ YES *(If yes, complete EXPECTED SUBMISSION DATE).* ☒ NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

On September 6, 2006, at 0137 hours with the plant at approximately 100 percent power, control room operators noticed rapidly rising condenser pressure. The operators commenced lowering reactor power in accordance with plant abnormal procedures, but could find no obvious cause for the increased pressure. When reactor power was reduced to approximately 45 percent power and condenser pressure remained above permitted values for continued operation, the reactor and main turbine were manually tripped at 0231 hours in accordance with procedures. Subsequent investigation determined the cause of the high condenser pressure to be air in-leakage from a broken low pressure turbine bearing waste water and oil drain pipe that is routed through the condenser. This pipe appeared to have failed as a result of cyclic fatigue that caused a complete shear of the drain pipe inside the condenser. The failed piping was plugged/capped at both ends, and the plant was returned to power operations.

This report is being submitted in accordance with the 10CFR50.73(a)(2)(iv)(A) as an event that resulted in manual actuation of the Reactor Protection System.

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17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

DESCRIPTION OF OCCURRENCE:

On September 6, 2006, at 0137 hours with the Davis-Besse Nuclear Power Station (DBNPS) in Mode 1 operating at approximately 100 percent power, control room operators noticed a rapidly rising condenser [SG-COND] pressure along with corresponding station annunciators and an automatic start of the mechanical hogger [SH-P]. The operators commenced lowering reactor power in accordance with Abnormal Procedures DB-OP-02518, "High Condenser Pressure," (Revision 04) and DB-OP-02504, "Rapid Shutdown" (Revision 09). Condenser pressure stabilized at approximately 6.7 inches Mercury Absolute (HgA) during the power reduction, which is below the setpoint for an automatic trip of the main turbine. Initial investigation for the abnormal pressure revealed no obvious causes. Therefore, when reactor power was reduced to approximately 45 percent power with main generator load less than 280 megawatts electric and condenser pressure remaining above 5.0 inches HgA, the reactor and turbine were manually tripped at 0231 hours in accordance with procedure DB-OP-02518 and procedure NOP-OP-1002, "Conduct of Operations" (Revision 03).

Unit response to the reactor trip was normal. Plant parameters stabilized within their normal post-trip values. Three Main Steam Safety Valves (MSSVs) [SB-RV] were observed to be exhibiting minor leakage following the reactor trip. Operators lowered Steam Generator pressures in accordance with procedure DB-OP-06910, "Trip Recovery" (Revision 11) from approximately 995 psig to approximately 840 psig in order to allow the MSSVs to reseat.

Initial notification of this automatic reactor trip was made to the NRC at 0533 hours on September 6, 2006, in accordance with the four-hour reporting requirement of 10CFR50.72(b)(2)(iv)(B) (Event Number 42828). This report is being submitted in accordance with the 10CFR50.73(a)(2)(iv)(A) as an event that resulted in manual actuation of the Reactor Protection System [JC].

APPARENT CAUSE OF OCCURRENCE:

A problem Solving and Decision Making team was convened, and the investigation determined that the cause of the high condenser pressure was due to air in-leakage from a broken Low Pressure Turbine Bearing Waste Water and Oil Drain pipe [TF-DRN]. The purpose of this drain pipe (also referred to as a "slop" drain) is to collect any oil and waste water from around the low pressure turbine bearings and route this waste to a common collection sump. Four of these 1½ inch drain lines exist, one for each Low Pressure Turbine Bearing. Because of the location of the catch basin, the drain lines are each routed through the Condenser. These drain lines are designed to remove water or oil that may accumulate due to mis-operation or malfunction of the turbine steam seal or lubricating oil system and/or spillage and seepage that may occur during maintenance outages. An additional purpose of these drain lines is to provide a means to collect and retain turbine bearing lube oil in the event of a catastrophic or chronic bearing oil leak. However, during normal operations, these drain lines have no flow.

Inspection of the Low Pressure Turbine 1-1 bearing number 4 drain piping at the condenser outlet via boroscope revealed the piping experienced a complete shear a few inches inside the condenser. The failed drain piping was plugged/capped at both ends via a Temporary Modification. A stabilizing pipe was also inserted to ensure the piping was supported to prevent potential damage to the condenser internals during the balance of the operating cycle. Condenser pressures returned to normal following plugging/capping of the drain piping, and the plant was returned to power operations. Because the piping was plugged and capped without removal or inspection of the broken piping, no metallurgical

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17. NARRATIVE *(If more space is required, use additional copies of NRC Form 366A)*

APPARENT CAUSE OF OCCURRENCE: (continued)

analysis of the failed piping was performed to determine a definitive cause of the piping failure. However, the piping is located directly below the steam pathway as it exits the low pressure turbine. Because of the observed complete shear of the piping and apparent lack of supports for this piping inside the condenser, the piping likely failed due to cyclic fatigue (most probable cause). This fatigue was likely the result of turbulent steam flow from the discharge of the turbine contacting the horizontal sections of the piping, resulting in piping vibration and/or deflection, and the resultant cyclic stresses eventually led to failure of the piping.

The turbine bearing waste water and oil drain piping was not included in key design documents and the system engineer was not aware that the piping existed, which allowed the situation to remain undetected for an extended period of time. Therefore, review of design information incorrectly determined that this piping was not installed at the DBNPS. This lack of information in key design documents helped create a mindset that would carry over to later Operating Experience reviews.

Review of this event identified that industry documents (Operating Experience) were published prior to the DBNPS manual reactor trip regarding failures or degradation of turbine bearing waste water and oil drain piping. While some of these piping failures were attributed to erosion/corrosion of the piping, others were similar to the DBNPS event where the piping failed suddenly, resulting in a rapid plant shutdown and/or trip. This event may have been prevented had a more rigorous review of industry experience been performed, which may have led to the identification that similar drain piping was installed at the DBNPS.

ANALYSIS OF OCCURRENCE:

There were no safety concerns identified during or as a result of this event. Plant post-trip response was normal, and condenser pressures stabilized at approximately 7 inches HgA. Because condenser pressures remained below 10 inches HgA, the Auxiliary Feedwater System [BA] was not required to be placed in service. Therefore, this event had minimal safety significance.

CORRECTIVE ACTIONS:

The failed Low Pressure Turbine 1-1 bearing number 4 drain piping was plugged and capped via a Temporary Modification on September 7, 2006. The piping for the other three drains will be cut and capped in the near future to prevent a similar event.

The System Descriptions for the Main Turbine and Auxiliaries System and for the Condensate System will be revised by March 1, 2007, to document the purpose of the turbine waste water and oil drains and to show they are routed through the condenser.

During the next refueling outage (currently scheduled for Spring 2008), the four turbine waste water and oil drain lines will be permanently removed via an Engineering Change.

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17. **NARRATIVE** *(If more space is required, use additional copies of NRC Form 366A)*

FAILURE DATA:

There have been no Licensee Event Reports at the DBNPS involving a manual or automatic reactor trip due to degraded condenser vacuum conditions in the past three years. While no failure of the turbine bearing waste water and oil drain piping has been previously experienced at the DBNPS, similar failures have been documented at other facilities. As discussed previously, a more rigorous review of these previous industry events may have prevented this event.

Energy Industry Identification System (EIIS) codes are identified in the text as [XX].

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